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THE FIRST NATURAL HISTORY MUSEUM IN AMERICA

By Dr. GEORGE GAYLORD SIMPSON

AMERICAN MUSEUM OF NATURAL HISTORY

ADMIRATION for superlatives is a human (some say more particularly an American) trait. For the thousands of employees of American natural history museums and for their millions of visitors the identification of the first and the oldest institution of this sort has inevitable fascination. This honor is frequently and authoritatively claimed for the Charleston Museum.[1] As far as I know, the claim is not currently made for any other museum. Nevertheless, renewed study of the available historical data shows that some facts have been overlooked and that the previous honest and able interpretation of others becomes equivocal when provided with more complete background. It is, in fact, most unlikely that the Charleston Museum can properly be designated either the first or the oldest in America, and the statement requires careful reconsideration before it becomes ineradicably imbedded in the accepted histories of science.

[1] The claim is included in most of the publications of the Charleston Museum and was particularly publicized by a meeting of the American Association of Museums in Charleston in 1923 on the occasion of celebrating the "150th anniversary" of the "first museum founded in America." The following are among the many historical papers and books in which the Charleston Museum is unqualifiedly accepted as first and oldest in America: P. M. Rea, *Proc. Amer. Assoc. Mus.*, IX, pp. 53–65, 1915; L. M. Bragg, *Charleston Mus. Quart.*, I, pp. 3–13, 1923; C. Schuchert, *Bull. Peabody Mus. Nat. Hist.*, I, No. 1, pp. 9–23, 1926; W. M. Smallwood and M. S. C. Smallwood, "Natural History and the American Mind." 1 vol., 8vo. New York. 1941.

The facts are a matter of record and their interpretation is a matter of impartial scientific method. This reconsideration is in no sense an attack on the admirable Charleston Museum, the present excellence and past achievements of which are not depreciated by denial of its historical priority. Museums are temples of truth, and the Charleston Museum welcomes any contribution to the truth concerning itself.[2]

The growth of natural history museums was gradual, and in such a sequence the designation of an absolute first is virtually impossible. Did American natural history museums begin when a colonist first put a curiosity in his parlor? When a society first installed samples of natural productions in its rooms? When a collection was first opened to the general public? When the first organization specifically for the maintenance of such a public exhibition was formed? Most of these transitions were gradual, and in no case is there any assurance that an earlier incident has not been overlooked. It is, however, possible to establish some dates and to set up a sequence among certain known museums and museum-like institutions.

The American Indians had "private collections" of objects that we would place in museums. They carry this phase of the history back to 900 A.D. at latest. The white colonists also had personal natural history collections at least as early as the seventeenth century. Such private enterprises were the forerunners of museums, but it will hardly be claimed that they were museums in any strict sense.

The beginning of museums is more definitely seen in the acquisition and exhibition of specimens by various societies. The earliest collection of this sort known to me—caution forbids claiming it as the first in fact—belonged to the American Philosophical Society, Philadelphia. The date on which this collection was begun is unknown, but it was prior to April 20, 1770, because on that day a proposal was made to enlarge the collection, which therefore existed.[3] This collection was available to members and to others on application, and it was also open to the public at large while under the aegis of the elder Peale in 1794 to 1811. It was continuously cared for by curators, so designated, and was greatly enlarged up to 1849, when it was deposited in the Academy of Natural Sciences of Philadelphia. There this collection, begun in 1770 or earlier, still exists and is still the nucleus of a natural history museum. The Academy of Natural Sciences, itself, was founded in 1812 and it may now be the oldest natural history museum in America in terms of continuous existence under the same name and the same organization, although other claimants may well appear. Among other old museums still in existence as entities but changed in organization are the East India Marine Hall of Salem, 1799, now the Peabody Academy, and the mineral cabinets of Harvard, 1793, Yale, 1803, and Princeton, 1817, now included in subsequently founded university museums.[4]

The Philadelphia Museum, founded by Charles Willson Peale in 1785, was one of the first, probably the first, of American public natural history museums to be definitely founded and organized as such.[5] The Peale collection was privately owned, but the status of the museum as a fully public institution is amply attested, among other things, by its direction by a board of "visitors" (we would say trustees or directors) of which Thomas Jefferson was first president, by its display in the Philosophical Society's Hall along with the society's own collection and by its later occupancy of the public building now called Independence Hall. An admission fee was charged (as in many later public museums) but there was no other requirement for admission. As far as I have learned, previous American collections or museums were open to members of some organization or by permission of the owners and hence can not be called fully public.

This museum no longer exists as such, having been dispersed after about sixty years, and therefore does not bear on the question of which is the oldest among our existing museums. Whether it was the first is a matter of definition. It probably was the first that could properly be called a public museum, if "public" is defined by full availability to the population at large. If "public" is additionally defined as involving institutional or communal rather than personal ownership, some claim could still be made for the Philadelphia Museum as regards the period (1794 to 1811) when it displayed not only Peale's collection but also that of the Philosophical Society. Under this or a still more stringent definition, however, this honor might have to go to some later institution.

January 12, 1773, sometimes accepted as the date of the founding of the Charleston Museum, was the day on which the Library Society of Charles-Town voted to establish a museum. This proposal was made nearly three years after the Philosophical Society's cabinet is known to have been in existence. The effective acquisition of a natural history collection by the Library Society appears to have been still later. The Library Society's proposal was for a "museum" and

[2] This statement is authorized by G. Robert Lunz, Jr., curator of the Charleston Museum, who kindly read and commented on the present note before it was sent to press.

[3] American Philosophical Society. 1884. Early proceedings from the manuscript minutes of its meetings from 1744 to 1838. *Proc. Amer. Phil. Soc.*, XXII, Pt. III, No. 119. [See entry for April 20, 1770; the contemporaneous minutes are in the Society Archives.]

[4] These universities had some natural history specimens at still earlier dates, Yale at least as early as 1786 and Harvard by 1784.

[5] H. S. Colton, *Pop. Sci. Monthly*, LXXV, pp. 221–238, 1909. Publications by the Peales and data in the archives of the American Philosophical Society have also been consulted.

the Philosophical Society had a "cabinet," but to base any claim for priority on this verbal distinction-without-a-difference would completely lack historical or scientific justification. For the men of that time "museum" and "cabinet" were synonyms as used in this connection and the collections in Charleston and in Philadelphia had the same status: both were devoted to the public good but both were society collections. Reverting to definitions, if a society collection arranged and displayed for members and authorized visitors is a museum, both of these were museums and that in Philadelphia was certainly older. If an exhibition must be more public to be called a museum, then neither of these was a museum despite the fact that the collection in Charleston was called such in a sense different from this.

An exhibition in Charleston, no longer sponsored by the Library Society but by the Literary and Philosophical Society of South Carolina, was opened to the public, on payment of a fee, in 1824, in conscious imitation of Peale's Philadelphia Museum, then 39 years old.

The descent of the present Charleston Museum from the museum of the Library Society of Charles-Town is based on the transfer of specimens from one institution to another, without continuity of organization, personnel, name or establishment. The Literary and Philosophical Society of South Carolina started a museum in 1814, and the collections of the Library Society were presented to this in 1815. It was this second of the museums in Charleston that was opened to the public in 1824 under the name, The Museum of South Carolina. The attempt to raise money for a building was unsuccessful, and in 1827 the collections were deposited in the Medical College of the State of South Carolina. In 1850 still another museum was established, this time by the College of Charleston. Along with various other collections, this museum acquired by gift the Literary and Philosophical Society Collection, which still included some specimens that had belonged to the older Library Society. In 1907 the museum of the College of Charleston acquired its own building and in 1915 it was incorporated as the Charleston Museum. (Dates and data from Rea, corroborated by others. See first footnote.)

Thus the present Charleston Museum has existed as an entity since 1850 and has had its present name and organization since 1915. It possesses specimens that were added (in 1798 and later) to a collection begun, or proposed, in 1773. If this possession be considered as involving some sort of continuity for the institution, then priority by similar but more direct continuity must be granted to the Philadelphia Academy (which is a museum and not an academy in the more common sense) as depository for a collection begun in 1770 or earlier.

Many other early American collections and museums are worthy of remembrance and discussion. Some were first in one respect and some in another. Which, if any, can be truly called *the* first or *the* oldest is left to the discretion of the reader and of historians.

COOPERATION WITH THE FILM INDUSTRIES IN THE STUDY OF PRIMITIVE MUSIC

Professor CARL E. SEASHORE

THE STATE UNIVERSITY OF IOWA

ACOUSTICAL engineering, playing into the hands of the theater, has made great progress within the last few years revolutionizing the means of communication, enriching the resources of the art of public entertainment and changing the economies, interests and tastes of the public. The acoustical engineer has dealt primarily with the physical instrument and its environment; the theater has dealt primarily with the problem of merchandizing amusement. But each has an equally large field of approach quite untouched. The acoustical engineer must reach out into the psychological and phonetical analysis of human hearing and feeling as they function in music and speech, and the theater must take cognizance of the educational value and the factual basis of its informational films.

The informational value of amusement through tone films has increased the educational power of the theater to an extraordinary degree. But in so doing the producers have failed to recognize the sanctions and canons which are demanded by a scientific approach to music, speech and pictures. They have engaged entertainment experts to select and organize for pictures in the field. In so far as the interests of music are concerned, the time has now come to consider the factual side of the picture at the source by having scientific experts associated with the entertainment experts. Let me outline briefly a proposal which I made to the motion picture academy in Hollywood at the time the film Trader Horn appeared, asking for recognition of faithfulness in fact and educational utility of informational films.

To illustrate my point of view in a concrete case,

let us consider the planning of a specific project for penetration into a primitive community. Let us say that one of the standard producers is undertaking to make a film to represent the primitive culture of a relatively pure strain of savage people in one of the South Sea islands.[1] In the interest of securing correct and effective representation of the resources, characteristics and uses of music and allied dance and speech in this primitive group, the producers should send a competent musical anthropologist to the locality a year or two in advance of the actual photographing. Among the qualifications and functions of such an expert for the study of primitive music would be the following:

(1) He must go well prepared in the psychology of music, the history and theory of music and the anthropological and ethnological literature bearing on primitive music and allied arts, such as the dance, drama, speech and magic, in order that he may have in command a well-organized matrix of facts and theories into which he is to set new facts and classify his observations.

(2) He will cultivate the acquaintance and good-will of the primitives in such a way as to be admitted to the dwellings, the ceremonials and all outstanding types of activity in which there may be some semblance of a function in music. In so doing, he should be able to select unobtrusively the outstanding performers for the demonstration of scientific aspects of this project and at the same time prepare for the cameraman by identifying interested groups which might function willingly and faithfully upon his appearance. Primitive communities are conservative, but they are interested in all forms of magic. It should be the function of the scientist to utilize this interest in cultivating responses which shall reveal the true life of the people. For this purpose such devices as the phonograph, the camera and moving pictures may be employed to create a receptive atmosphere for the incoming film organizers. While the scientist is initiated into the life of the tribe or community by his two years of residence, he will lead a sort of heroic life by introducing into their play life a pattern which is in harmony with their culture level and will lead to self-forgetfulness and revealing self-expression in all performances.

(3) Through such patronage of the industry for an adequate period of intensive study of the musical life of the community, the scientist should be able to discover and isolate characteristic features of a purely scientific interest and rehearse these in significant forms through his play life with the people so that at the time of the arrival of the photographers he will have a purely scientific program set up in the form of a series of short specific acts which may later be taken purely for a scientific purpose and will constitute a well-designed scientific collection which is made during his residence. Producers have assured me that they would be delighted to take these pictures without cost to the scientific interests in recognition of the service rendered and donate them to appropriate collections unretouched and freely available for scientific study by home experts. In his critical and constructive study, the scientist should exercise insight into the various types of affiliates with music; such as dance, speech and mimicry, and try to reveal the ethical and esthetical significance of the entire setting at the culture level of this particular group. The sound films will, of course, be accompanied by moving pictures revealing the actual behavior and environment in which the performance took place.

(4) In the meantime because of his personal fitness and training, the collector will have paved the way for the organization of amusement features which will give effective cues and provide trained actors for the exhibition films. This in itself would be an adequate service for which the producers would be glad to cover the expenses of the scientist. Naturally he would serve as a consultant in the organization of the amusement features in such a way as to give them a sound educational tone and validity. This well done would give scientific and educational value to the pictures in the theater. It should in no way interfere with the entertainment value of the picture because patrons of the movies would be quick to discover that in such cases truth may be stranger than fiction.

(5) It is conceivable that the purely scientific pictures authorized by the sponsoring scientists might even find a place as shorts in the standard theater films. The adoption of that policy might prove an innovation now that education in popular science is so general in this country.

(6) The right to advertise the backing of scientists in moving pictures has justly been the bugbear and drawback in enterprises of this kind. But this is due to the failure to develop and follow a reasonable policy of cooperation. Both parties can now take a long stride forward in solving this problem. The two interests are now so closely dovetailed that some satisfactory way of cooperating must be found. To be effective, any such plan must operate in the selection and sponsoring of the scientist and must be defined specifically in his contract. Scientists and educators should realize that it is an obligation and is as much to their profit as it is to the profit of the industry.

[1] The same principle would apply to the filming of racial characteristics of music or racial life in general, not necessarily primitive, such as the music of the American Negro or Indian or any clean-cut national type of folk music.

(7) The first steps in the scientific work on such a collection in the field of primitive music would naturally be (a) to take the films into the laboratory and rephotograph them in suitable form for construction of performance scores[2] for which we now have adequate techniques and patterns; (b) these performance scores should then be published in order that they may be permanently preserved as a graphic representation of all the findings; and (c) the collector should publish with the performance score his technical field notes.

(8) To implement the scientific use of the collection, it is essential that the various musicological, psychological and anthropological organizations for research should cooperate with their representative, not only in the recognition of him as the authentic collector, but in the organizing of research staffs for the purpose of utilizing the collection in the various scientific interests. It is therefore desirable that the prospective collector should, before he goes, acquaint himself with the ways and means of promoting research in this field through the various professional research agencies. A one-man collection of that type could serve as sufficient research material for a large staff of workers.

In conclusion I may say that when I first broached this proposition to the Academy of Motion Picture Arts and Sciences in Hollywood, great interest was shown, and from several sources I heard the question, "Where is your man?" I gained the impression that if the right man had been available at that time, the project would have been undertaken immediately.

SCIENTIFIC EVENTS

RECENT DEATHS

ERNEST CALVIN BRYANT, professor emeritus of physics of Middlebury College, died on September 7 at the age of seventy-five years.

DR. HENRY RAWLE GEYELIN, assistant clinical professor of medicine at Columbia University, died on September 7 at the age of fifty-eight years.

MARTIN LUTHER GRIFFIN, retired chemical engineer, died on August 28 at the age of eighty-three years.

ARTHUR C. TOZZER, civil engineer, vice-president and a director of the Turner Construction Company, New York City, with which he had been associated since 1905, died on September 9 at the age of sixty-three years.

THE death is announced of Dr. John Henry Salter, known for his work in ornithology, entomology and systematic botany, from 1891 to 1908 professor of botany at University College, Aberystwyth, Wales.

THE ACHIEVEMENTS OF MEDICINE IN SIBERIA

ACCORDING to information sent to SCIENCE by the Soviet Embassy, a scientific conference recently took place in one of the medical institutes of Novosibirsk. This conference was devoted to the anniversary of the activity of medical institutions in Siberia during the war. Over three hundred surgeons and scientific workers participated. The work that is being carried on by the Siberians during the war was illustrated by eighty-five reports and communications which aroused great interest. The report continues:

Professor Schneider described his new methods of skin plastics. Professor Kohn and Shereshevsky spoke of the origin of dimness of the vitreous body in the eye and ear and of the new methods of treatment. Professor Menshikov made a report of his experience in treating complications caused by wounds of the thorax.

The experience of local hospitals has made it possible to start anew the elaboration of the following problems of war surgery, namely, the treatment of gunshot fractures, accumulation matter in the pleural cavity, adaptation of roentgen-therapy and of new apparatus for mechano-therapy. Dr. Pogorelsky related his experience in treating irregular concrescence of thigh fractures through bloodless transference into normal position. Members of the conference were highly interested in the apparatus demonstrated by Dr. Freifeld, who had constructed out of wood a universal set for mechano-therapy and medical splint for active movements of fingers and hand. Professor Pavoletzky and Dr. Khalinsky had applied with great success roentgen-therapy for treating war traumas. The communication by Dr. Tugetzky on the development and innervation of blood vessels in a man caused great interest and wide-spread approval.

In the first half of July the session was organized in Novosibirsk by the All-Union Institute of Experimental Medicine. This was quite an event in the medical world of the Siberian capital. Several hundreds of scientific workers and surgeons were present at this session. Professor Grastchenkov gave a report on "character of modern wounds of the skull and brain and their graded treatment"; Professor Menshikov on the significance of vitamins in complex therapy of war traumas; Dr. Levkovich on the etiology and prophylaxis of spotted fever; Professor Davrentiev on the morphology regeneration of the nerve-trunk. It is known that when a part of the nerves is traumatized or annihilated by a bullet or shell fragment, the part of the body supplied by nerve branches loses its sensibility and its motor capacity. New plastic methods of nerve conduction revive the ability to work of thousands of soldiers suffering injuries of the peripheral nerves.

[2] See Univ. Ia. Stud. Psychol. Mus., IV, 1937.

AERONAUTICS AT THE UNIVERSITY OF ILLINOIS

THE University of Illinois announces that funds will be sought to create an airport adequate for instructional and research purposes.

The university has completed a free summer course for high-school instructors in aeronautics. The seventy men who took this course now are back at their schools giving secondary school pupils basic information about air power and its importance in war and peace.

Research at Illinois into air transportation problems will include study not only of the machines and the airports necessary for their use, but also of the men who operate and use them. Already allocated is a sum of $190,200 for initial building changes, equipment and installations to further a research and educational program on the influence of atmospheric environment, including the problems of aviation, submarine and military medicine.

The program of the College of Medicine in Chicago, in cooperation with the College of Engineering at Urbana, follows research projects under way since 1937 by the Colleges of Medicine, Agriculture and Engineering which concerned the influence of atmospheric environment on humans and animals.

To provide for actual "in-the-air" educational and research activities, President Arthur Cutts Willard has announced that his next budget request to the State Legislature will include an item of $200,000 for the purchase of a square mile of land at Urbana-Champaign for a university Class 3 airport capable of handling planes up to 50,000 pounds gross weight. Among the uses of the airport will be the Civilian Pilot Training program in which the university has taken part for several years, and probably the establishment after the war of an aviation unit in the university R.O.T.C.

In expanding its activities to education and research for air transportation, Illinois is continuing the service policy under which it was established and under which it has made important contributions to the two leading forms of land transportation—railways and highways.

As the state university of the nation's railway center and leading railway state, it established the first department of railway engineering, and its researches into roadbeds, rails, brakes, wheels, fuel and other railway subjects has contributed much to safe and fast trains.

Likewise, the university was a pioneer in the study and development of reinforced concrete. Its research contributions on the relative merits of butt welds and rivet stresses have proved important in ship building. Highway research has included not only the roadway and its problems, such as materials and joints, but also intensive study of bridges of all kinds both of steel and of concrete.

MICROFILM PHOTOGRAPHY

AIR conditioning is serving a useful role in helping to preserve and protect priceless documents against the hazard of bombing raids. Experience with microfilm photography in the Photographic Laboratory at Brown University shows that air conditioning is essential to this process, now in increasing use, as a means to guarantee against the loss of valuable records and documents.

"Microfilm requires precise control in processing if the results are to be reliable and permanent," according to Edward C. Roosen-Runge, in charge of the Brown laboratory. He states:

> In our laboratory the dark room, enlarging room and camera room are all air conditioned and kept summers and winters at 68° F. and 50 per cent. humidity.
>
> The air conditioning serves three purposes: First, the air is kept dust free, which is of the greatest importance because of the smallness of the printed matter on the film. One dust particle on the film or one scratch caused by dust may obscure a whole word completely.
>
> Second, the temperature control is a very essential help in obtaining even results in processing, quite apart from the convenience and comfort of the operators.
>
> Third, the humidity control serves to keep a perfect storage condition for the film. In addition, it again helps toward a precise control of the processing and drying.

The Brown University Photographic Laboratory, employing Carrier refrigeration and air-conditioning equipment, is working on several microfilm projects. One of these involves microfilming for the expansion of the Brown Mathematics Library, already well-known throughout the country. About 1,000,000 pages have so far been photographed in this project. Another is concerned with the microfilm service for *Mathematical Reviews,* an abstract journal. In connection with the publication of this journal, the mathematical articles to be abstracted are photographed on microfilm. The subscribers to the journal may order at special rates copies of the complete articles either as photoprints or as microfilm. The photographic laboratory has made so-called master negatives of about 6,500 articles on film which are stored in the laboratory in a special file.

A project to film books on South American history and Hispanic culture at South American libraries forms another use for microfilm. The films are processed in South America and sent to the laboratory where copies are made. One complete copy is destined for the Library of Congress. More than 100 reels containing about 1,150 items have been photographed so far.

THE COMMITTEE ON CONSERVATION EDUCATION

THREE years ago Mr. Darling, as president of the National Wildlife Federation, and its executive board asked Dr. Henry B. Ward to assume the position of chairman of a new committee. Conservation education had been proclaimed as the primary objective of the federation and he undertook to devote his time to the promotion of this objective.

The work is carried by a small committee of official members and an informal advisory board of approximately 1,000 teachers and leaders in educational circles. These informal advisers are distributed over the length and breadth of the United States. They were willing to aid the promotion of a genuine educational movement, but did not desire to have their names and addresses published, since that would inevitably lead to added correspondence, discussion and perhaps extended argument which they felt could not be handled without waste of time and energy as well as probably also unfortunate interference with their professional duties and obligations in other directions. The work has been carried on actively, but with relatively little publicity.

The first public undertaking was a conference on education in conservation held at the annual meeting of the National Wildlife Federation in Detroit on February 16, 1939. The record of this conference is given in the first pamphlet issued by the committee. It contained the keynote address of the campaign, by Thomas Eliot Benner, dean of the college of education, University of Illinois. This, which outlined a general plan of action and sequence of steps that should be taken to achieve satisfactory results, was followed in the pamphlet by half a dozen brief comments on special movements in conservation education at different points.

A year later at the Washington meeting of the federation a round table discussion was held which with a report of progress by the chairman was printed as the second pamphlet, which opens with a report on the year's work directed towards reaching conclusions on the problems set forth in Dean Benner's address. In the pamphlet this report was followed by brief comments and criticisms.

The third publication took the form of a symposium on "The Foundations of Conservation Education." It assumed the proportions of a book and constitutes the first educational contribution on this topic which has appeared.

A fourth publication entitled "Teaching Conservation in the Public Schools" has been prepared. Its printing and distribution will be carried out as soon as conditions permit.

Colored stamps, portraying types of life, both plants and animals, are issued in sheets every year in connection with the celebration of National Wildlife Week, designated by the President. Leaflets and pamphlets dealing with individual problems or projects of interest to the lover of nature and with fishing and hunting are issued irregularly and distributed on request. Unique grade school booklets have been prepared by a group of successful teachers and printed in attractive form for use in grades three to eight of the public school system.

Full information on work of the federation may be secured from the business office of the National Wildlife Federation, 1212 Sixteenth Street, N.W., Washington, D. C.

THE RESEARCH ADVISORY COMMITTEE OF THE NATIONAL ASSOCIATION OF MANUFACTURERS

DR. A. R. OLPIN, director of the Research Foundation of the Ohio State University, has been appointed chairman of the Research Advisory Committee of the National Association of Manufacturers, which met for the first time under its new chairman in New York City on September 10. Dr. Olpin succeeds Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, who has resigned because of the pressure of other war work in which he is now engaged. Matters on the agenda for the New York meeting included proposals for the exchange of information by universities and research institutes and coordination of research activities in connection with the war effort.

Dr. Olpin has been director of the Research Foundation since 1938. In that work he now has the responsibility of administering research contracts amounting to well over a million dollars annually. In addition he serves as consultant to several war committees in Washington.

Other members of the National Association of Manufacturers Research Advisory Committee include Dr. Henry A. Barton, the American Institute of Physics, New York; C. W. Good, the Department of Engineering Research, University of Michigan; Dr. Ross G. Harrison, National Research Council; G. Stanley Meikle, Purdue Research Foundation, Lafayette, Ind.; Dr. R. A. Millikan, California Institute of Technology; Dr. F. R. Moulton, the American Association for the Advancement of Science; Dr. George R. Pegram, Columbia University; Nat Sage, Massachusetts Institute of Technology; Raymond Stevens, Arthur D. Little, Inc.; Dr. E. R. Weidlein, Mellon Institute of Industrial Research; Dr. John T. Tate, University of Minnesota; Julius Weinberger, Radio Corporation of America, New York City.

SCIENTIFIC NOTES AND NEWS

DR. CHAUNCEY D. LEAKE, librarian and since 1928 professor of pharmacology at the Medical Center at San Francisco of the University of California, has been appointed vice-president of the University of Texas in charge of its medical program. Dr. Leake will be stationed for the present at the University of Texas Medical School at Galveston. The incorporation with the university of the Texas Dental College under Dean F. C. Elliott has also been announced. Plans have been made for a graduate medical center at Houston to include cancer work sponsored by the M. D. Anderson Foundation, to be under the direction of Dr. E. W. Berger.

DR. HENRY A. CHRISTIAN, Hersey professor of the theory and practice of physic, emeritus, has been invited by the president and fellows of Harvard University to return to active duty to give clinical instruction. Also, he has been appointed visiting physician at the Beth Israel Hospital, Boston.

DR. NEIL E. GORDON, of Central College, Fayette, Mo., has been appointed head of the department of chemistry at Wayne University to fill the vacancy caused by the retirement of Frederick C. Irwin a year ago.

THE Moxon Medal of the Royal College of Physicians of London has been awarded to Professor L. G. Parsons for his observation and research in clinical medicine, especially in pediatrics; the Weber Parkes Prize to Professor G. S. Wilson for his work on tuberculosis, and the Murchison scholarship to Dr. Hector John Anderson (St. Thomas's).

THE honorary medal of the Royal College of Surgeons of London has been awarded to Lord Nuffield in recognition of his service in "assisting the improvement of natural knowledge and of the healing art and of his many liberal acts and distinguished labors inspired by the desire to advance the science and practice of medicine and surgery." The medal was instituted one hundred and forty years ago and this is the nineteenth occasion on which it has been awarded. The Gilbert Blane Medal was presented recently to Surgeon Commander Edward Rex Pascoe Williams for his original work on blast effects in warfare. This medal was founded in 1830 by Sir Gilbert Blane, a distinguished physician, known for sanitary reforms in the Navy and for successful measures for the prevention of scurvy. It is awarded annually to a medical officer in the Royal Navy for "skill, diligence, humanity and learning in the exercise of professional duties."

PROFESSOR KENNETH W. SPENCE, associate professor of psychology at Yale University, has become head of the department.

PROFESSOR ARIEL A. BENEDICT, of the department of physics of Iowa State College, has resigned to become head of the department of physics at Muskingum College.

PROFESSOR HOWARD M. FRY has been appointed head of the department of physics at Franklin and Marshall College.

IN the College of Applied Science of Syracuse University, Howard W. Eves, of the mathematics staff of the Tennessee Valley Authority at Chattanooga, Tenn., has been appointed assistant professor of applied mathematics, and Kenneth C. Tippy, of Chicago, has been appointed assistant professor of civil engineering.

DR. ARTHUR R. CARR, dean of the College of Engineering of Wayne University, has been appointed institutional representative of the Engineering Science Management War Training Program sponsored and financed by the government. This program includes sixty-three different tuition-free defense courses to be offered for the new semester by the departments of engineering, business administration and physics.

AT Cooper Union, New York City, Dr. Alfred Reis, who formerly engaged in research at the Sorbonne, has been made adjunct professor of metallurgy, and Professor John A. Ely, of the University of Hawaii, a former dean of engineering at St. John's University, Shanghai, has been appointed adjunct professor of civil engineering. Walter S. Watson, director of admissions and student relations, has been promoted to an associate professorship of psychology.

THE resignation is announced of Dr. Charles Hendee Smith, professor of pediatrics at the New York University College of Medicine.

DR. LAWRENCE T. ROYSTER, head of the department of pediatrics of the department of medicine of the University of Virginia, Charlottesville, has resigned.

THE retirement is announced of Professor W. Peddie from the Harris chair of physics at University College, Dundee, in the University of St. Andrews.

DR. CHARLES BYRON JOLLIFFE, assistant to the president of the Radio Corporation of America and chief engineer of the laboratories, has been appointed vice-president and chief engineer of RCA Manufacturing Company, Camden, N. J.

DR. HAROLD G. WOLFF has been appointed neurologist in charge of the new pavilion of the New York

Hospital for the study and treatment of neurological cases. Neurosurgery has been placed under the direction of Dr. Bronson S. Ray.

DR. TOM D. SPIES, on leave of absence as associate professor of medicine of the College of Medicine of the University of Cincinnati, is reported to have accepted an invitation to continue his experiments at the Hillman Hospital, Birmingham, for another year. A large part of his work in vitamins was carried out at the hospital. Plans are being considered to enlarge his laboratory facilities.

THE Near East Foundation announces that Professor O. S. Morgan, professor of agriculture at Columbia University, has left by plane for Beirut to expand the agricultural program of the foundation in Lebanon and Syria. He will make his headquarters at the American University of Beirut.

DR. FRANK E. EGLER, assistant professor at the New York State College of Forestry, Syracuse, has returned from Central America, where he has been engaged since February in studies on the sapodilla tree, source of chicle, and on rubber and antimalarial drugs.

DR. CARL R. FELLERS, research professor of horticultural manufactures at the Massachusetts Agricultural Station, has been called to active duty with the Chemical Warfare Corps of the Army.

THE following members of the faculty of Iowa State College have been called to service with the forces of the United States: Professor Jean C. Hempstead, department of general engineering, first lieutenant in the Engineers Corps at Maxwell Field, Ala.; Professor Charles G. Rowe, department of modern languages, lieutenant and language specialist in the Navy Language School, Cornell University; Professor Archie Higdon, department of theoretical and applied mechanics, major with the Army Air Forces at Jefferson Barracks, Mo.

IT is reported in *Nature* that a panel has been set up in England to inquire into the possibility of improving the ventilation of tanks either by use of refrigeration or by air conditioning. It is constituted as follows: S. A. Wood, senior scientific officer, Scientific Research Department, Ministry of Supply; Dr. Dorey, chief engineer surveyor, Lloyd's Register; and Dr. Ezra Griffiths, principal scientific officer, Department of Physics of the National Physical Laboratory.

DRS. STUART MUDD, of the University of Pennsylvania, and Michael Heidelberger, of Columbia University, will participate on the evening of September 23 in a discussion on "Vaccines Against Enteric Infections as a War Problem" at the College of Physicians and Surgeons, New York. The discussion is the first of a series being arranged by the New York Bacteriologists' War Research Projects Group to review bacteriological problems of current war importance in order to formulate research projects to be undertaken by members of the group. The group is an autonomous body originally formed through the efforts of the New York Branch of the American Association of Scientific Workers, which is planning to help to organize similar groups in other fields of science.

Archives of Biochemistry, a new journal in biochemistry, has been announced by the publishers, The Academic Press, Inc., 125 East 23rd Street, New York City. The first issue will appear about the middle of October. The purpose of the new journal is to provide a medium of publication for scientific papers in the widening scope of biochemistry. The fields to be represented are: Proteins, hormones, vitamins, viruses, enzymology, biochemical and biophysical research in chromosomes, metabolism, nutrition, photosynthesis, plant chemistry, organic chemistry as far as related to living organisms, colloid science in its biological applications and chemotherapy. The editorial board is composed of Professors M. L. Crossley, American Cyanamid Company, Bound Brook, N. J.; R. A. Gortner, University of Minnesota; F. C. Koch, Research Department of Armour and Company, Chicago; C. M. McCay, Cornell University; F. F. Nord, Fordham University; F. W. Went, California Institute of Technology, and C. H. Werkman, Iowa State College. Manuscripts may be sent to any of the editors or to the editorial office at 125 East 23rd Street, New York City. Two volumes per year are planned, the cost of each volume being $5.50.

DEAN FRANCIS G. BLAKE, of the Yale School of Medicine, states that a large group of medical texts has been given by Dr. Joseph Marshall Flint to the historical library of the School of Medicine. At the same time, he announced the establishment of the John E. Lane Collection of prints, to be built up around a nucleus of 136 medical engravings given to the library by Dr. George Blumer, David P. Smith clinical professor of medicine, emeritus. Dr. Blumer is giving his collection of framed engravings of medical figures to the historical library. The John E. Lane Collection will include, in addition to Dr. Blumer's gift, the entire collection of prints belonging to the medical school, many of which came to the library through a bequest of Dr. Harvey Cushing, as well as all other prints which may be added in the future. The collection is named in memory of the late Dr. John E. Lane, who served as a clinical professor of dermatology from 1920 to 1923 and from 1930 to 1933.

DURING the summer term (1942) at Clark University a special war service training course in the field of geography has been conducted. In addition to the

regular members of the staff the work has been supplemented by the following visiting lecturers: Dr. Charles F. Brooks, of Harvard, in meteorology; Arthur Robinson, of the Cartographic Division, Office of Coordinator of Information; Richard Edes Harrison, cartographer for *Life* and *Fortune;* George B. Cressey, Syracuse University; Earl B. Shaw, Worcester State Teachers College. The work has been under the immediate direction of Wallace W. Atwood, Jr., associate professor of geography, who has taken charge of cartography, photogrammetry, field work and map interpretation. President Wallace W. Atwood, Dr. Samuel Van Valkenburg, Dr. Clarence F. Jones and Guy H. Burnham have also contributed to the program. Special attention has been given to economic geography, the geography of the war zones and to training in geographic research. Several of those who have taken this work will soon go into active service. On September 21, a new group will be admitted for similar training for war service in geography. The demand for experts in this field is far beyond the present supply.

DISCUSSION

MODERN VOCATIONAL AGRICULTURE

"FORTY Years of Helping the Farmer with Knowledge," published in SCIENCE for June 5, is a frank and challenging article with much of which I can agree. However, it is distinctly misleading at certain points, particularly as it deals with agriculture in our secondary schools.

Modern vocational agriculture does not aim at holding all farm boys on the land. It assists in providing sound guidance regarding opportunities in farming and other agricultural occupations and then helps to train those who apparently will fare best if they follow these occupations.

Teachers of agriculture in the secondary schools do not confine their efforts to the teaching of boys. In 1940–41, the latest year for which I have data available, teachers of vocational agriculture in the United States taught 253,691 adults (exclusive of those enrolled in defense education classes) and 332,612 persons of high-school age. Enrolments in classes for adults are growing at a much more rapid rate than enrolments in high-school classes. Thus teachers of agriculture are already extensively engaged in working with people who are established in farming.

We recognize in vocational agriculture, as Dr. Chandler does, that experience in farming is the basic preparation for farming. We have found, however, that school instruction closely correlated with farming experience and some school supervision of farming experience make that experience much more valuable than farming alone can be. This combination of science with practice has proved most acceptable to the farming people of America, as shown by the rapid growth in the number of schools providing it and in the enrolments in the classes in agriculture in these schools. Approximately 9,000 high schools in the United States now offer vocational agriculture.

Teachers of agriculture are, in general, eager to keep in touch with the colleges of agriculture and their extension services. Often it has been made very difficult for them to do so. These teachers want graduate courses in agriculture as well as in education, but they are not always able to get appropriate courses. They want other types of assistance, but some colleges of agriculture have chosen to give nearly all their help to the county agents, ignoring the teacher group.

Here at the University of Illinois three eighths of the graduates of the College of Agriculture go into the teaching of vocational agriculture. This group is regarded by the college as a very important group, both before and after graduation. Through this group, the college has one of its most important outlets to the state. Two men are employed full time in liaison work between the college of agriculture and the teachers of vocational agriculture to determine the subject matter needs of these teachers and to secure from the college the services they desire. County agents and teachers of vocational agriculture have grown up together, have been educated together and work together in their counties in the spirit of a large but closely knit family. This is to a considerable extent the situation in most states.

It is unfortunate that California, in which the relations between vocational agriculture and the college of agriculture are probably the poorest in any state, should be held up as an example. Vocational agriculture in California has from the beginning been so nearly ignored by the College of Agriculture of the University of California that it has been considered necessary to set up a completely separated program for vocational agriculture whose isolation from the college of agriculture Dr. Chandler deplores. In spite of the indifference of the College of Agriculture, vocational agriculture has thrived in California. Several other colleges of agriculture started out in the direction in which California's College of Agriculture has gone but have retraced their steps, so that California is now unique in its relationships between the agricultural college and vocational agriculture.

Dr. Chandler seems not to be concerned with the effects on the public schools of removing from them an important branch of education. If agricultural education were to be turned over to agencies outside the local public schools, it would be easy to argue for turning over other types of education until little would be left of these schools. I am not at all concerned that this is going to be done. We may as well reconcile ourselves to the idea that agricultural education is to have an increasing part in our public schools and begin to work out more satisfactory relationships between this type of agricultural education and that sponsored by the agricultural colleges.

Some of Dr. Chandler's conclusions seem to trace to the limited conception of education implied by the title of his article. If we are only to "help farmers with knowledge" we shall go about the job one way; if we are to provide education in agriculture as a part of a general education, our procedure is quite different. Certainly agricultural education is much more than getting the newest sound facts about agriculture to the farm people.

Dr. Chandler's article provides further evidence that increased contacts between agricultural scientists and educators would be desirable. Perhaps, as one result of these contacts, the educators could answer the question: Why do scientists who reason well in their own fields often become inexact and unreliable when they stray outside them?

H. M. HAMLIN

UNIVERSITY OF ILLINOIS

ANTS AS PROBABLE AGENTS IN THE SPREAD OF SHIGELLA INFECTIONS

ANTS have not been incriminated as vectors of pathogenic bacteria affecting man, though medical entomology abounds with citations of flies as carriers of many species of bacteria. Even cockroaches have been suspected, but ants have not been mentioned. No reference is found in the available literature as to their role in this respect.

Theoretically, if flies can convey pathogens mechanically from infected to non-infected material, other insects should be able to do likewise. For some reason, ants, in tropical or subtropical regions where they abound, are prone to be accepted rather as a harmless invader to be combatted solely on an esthetic basis. They are driven from sugar, candy or other foods which are then consumed with little thought of contamination.

Recently in this laboratory, in the course of experiments on native food as a culture medium for Shigella, ants were found to carry these organisms. The original observation which led to this limited series of experiments was purely accidental. Portions of the native food, rice and beans cooked together with onions and tomato sauce, were inoculated with various strains of Shigella to determine whether this food was a favorable medium for the growth of the pathogens and thus a source of the dysentery so common in Puerto Rico. Following a 24-hour incubation of the plates streaked from this food, which had been inoculated with Flexner strains of Shigella, they were read, covered and left inverted on the laboratory table until the next morning. At that time unusual growths of non-lactose fermenting colonies, later identified as Shigella, were observed in a pattern similar to miniature rabbit tracks. Examination revealed a few ants on the table, leaving the plates. These were caught and allowed to walk on sterile MacConkey and S.S. agar plates which, on incubation, produced a growth pattern similar to the original.

Since it was impossible at the time to produce a laboratory ant-hill for control purposes, it was necessary to rely on those entering from the hidden colony. Many were caught as they made their first appearance in the laboratory, about six feet from the inoculated plates. They were allowed to walk across sterile plates and then were placed in large vaseline-rimmed pans. Others leaving the infected food were caught three to five feet away and, on exposure to sterile plates, produced pure cultures of Shigella. Since the MacConkey and S.S. agar are selective media, inhibiting *B. coli* as well as some Gram-positive organisms, the plates made from the entering ants were sterile 24 hours later. From this it was concluded that ants, placed in this container, were free from Shigella or Salmonella.

Food inoculated with *Shigella flexner* V was placed in one container. The ants fed readily during a period of four hours, when the food was removed and sterile plates introduced long enough to allow ants to walk over the surfaces. These plates produced *Shigella flexner* V. Twenty-four hours after feeding on the infected material, sterile plates were again introduced. These, too, produced the typical growth of Shigella marking the footprints of the ants. The process was repeated in forty-eight hours, but on these last plates no colonies appeared. About twenty ants of this group were then macerated and inoculated on plates; others placed in nutrient broth, which again failed to produce Shigella. This work was repeated with like results.

From these simple experiments it may be deduced that ants may carry bacteria on their feet from one place to another for at least 24 hours after feeding on or traversing infected material.

The ants used in this experiment were kindly identified by M. R. Smith, of the U. S. Bureau of Entomology, as tropical fire ants, *Solenopsis geminata* (F.).

This species is very common in Puerto Rico and is found in practically every kind of environment.

SOPHIE DEHLER GRIFFITTS
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MEDICAL ORTHOEPY

THE scientist who employs an instrument seeks to master the technique of its use in an effort to gain therefrom the maximal advantage. To a physician language is an indispensable tool, but once he has begun the study of medicine he rarely strives to increase his dexterity in its use. He comes to lay all stress on meaning and heeds not pronunciational faults in speaking or careless construction in writing. The errors in speaking are the more glaring since formal training in the pronunciation of medicine's specialized vocabulary is neither given to nor required of the would-be physician. It is rarely, too, that the physician has had formal training in the art of public speaking, although, to a greater or less extent, he must practice that art throughout his life. Should the medical school demand that training, stimulants would be less necessary for the audience which would remain awake at a scientific meeting. The snoring at postprandial and late afternoon lectures would be diminuendo instead of crescendo.

Since the problem of correct pronunciation is the more pressing I shall confine myself to it. That English pronunciation is capricious and irregular is well illustrated by the story of the Frenchman, who, after a period of diligent application to the peculiarities of English pronunciation, concluded that a week in London would act as a fillip to his flagging interest were he to spend it in attending some interesting plays. Accordingly on arriving in London he betook himself to the theatrical district and stopped to read the billboard on one of the playhouses. He read: "'Strange Interlude'—Pronounced Success." His comments at that would suffer by translation.

Although the problems of orthoepy are many, they are well summarized in a quotation from the latest edition of the Merriam-Webster dictionary:

> From the nature of the case, when the essential facts are considered, correctness of pronunciation must be a flexible term. It is perhaps as accurate a definition as can be made to say that a pronunciation is correct when it is in actual use by a sufficient number of cultivated speakers. This is obviously elastic, depending both on knowledge—not always obtainable—of the number of users, and on judgment as to the cultivation of the speakers. Mere majorities, without consideration of historical linguistic background and regional distribution, are not decisive.

This problem is not simplified when every user of a technical term considers himself qualified to determine its pronunciation, even though his knowledge of linguistic background may be nil. It would be as illogical for the physician to acquire his medical knowledge from a dictionary as for a careful user of language to acquire his knowledge of pronunciation from a physician. The arbitrament of the lexicographer is certainly to be preferred to chaos. In the coining of new terms to describe new knowledge, which is certainly the right of any educated user of a vital language, it is better to leave the problem of pronunciation to the lexicographer. With his knowledge of precedent he is better qualified in deciding the "correct" pronunciation by bringing to bear whatever semblance to logicality the flexible rules of orthoepy permit.

A few illustrations will justify the need for this plea. These illustrations include only terms for which but one pronunciation is recognized by the accepted dictionaries. Most of these orthoepic errors could be avoided by a thorough grounding in Latin and Greek, but it is a moot point as to whether the smattering of classical studies still required by some schools is of any value. As a former college instructor in the classics I consider it even more debatable as to whether a more extensive capital investment of time in classical studies would pay sufficient cultural dividends to make the investment sound. The time were better spent in subjects designed to broaden the cultural outlook of a future physician during that period of his education when his time is not so completely devoted, of necessity, to pure science. A very common error in the pronunciation of medical terms is to render as diphthongs vowels which should be sounded separately. This error has obtained so long that this pronunciation has gained recognition for some words. Thus, protein, correctly a three-syllable word, has been accorded but two; so also with caffeine, rabies and others. However, for such words as oubain, sparteine, codeine, caries, facies and others correct speech demands the pronunciation of all three syllables. Syndrome, analogous to epitome, should have all vowels sounded, but it has so long been mispronounced as a two-syllable word that lexicographers remark that pronunciation in medicine. There is a large class of words which is wrongly accented. Until recently correct speech placed the accent in abdomen on the second syllable. The word has been so long abused that the most recent dictionaries give the accent on the first syllable as a second choice. Words compounded with "acetyl-" should have the secondary accent on the first syllable but they are seldom accorded that measure of respect. The accent is usually placed incorrectly on the second syllable. Sulfonamide should be accented on the penult but it is usually the antepenult which we hear accented. Cerebral and verte-

bral are almost invariably mispronounced because they are accented on the second syllable instead of the first, as they should be. Dyspnea and related words are shamefully treated. The "p" is usually disregarded, although it should be sounded and the first syllable is incorrectly accented when the accent should be on the second.

These illustrations could be multiplied indefinitely, but it would serve no good end. This plea will have fulfilled its purpose if more attention be paid to lexicographic pronunciation and less to intuitive. It is true a vital language is continually changing, but it is dubious if changes emerging from ignorance constitute progress. Much would be accomplished if medical school staffs emphasized orthoepy more, since it is from them that future physicians first learn medical terms. Their present carelessness in speech is a sorry contrast to the thoroughness and scope of their scientific training. The man who speaks with care arouses in his audience a greater feeling of confidence in the potential accuracy of his scientific conclusions.

BRADFORD N. CRAVER

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A SEVEN-YEAR-OLD BANK SWALLOW

IN the summer of 1937 it was our good fortune to recover as a return at Oneida Lake, N. Y., a banded bank swallow, *Riparia r. riparia,* the known age of which was at least six years.[1] This bird had been banded by us as a nestling on June 30, 1931, about one-half mile from the point of its recovery. Until the present writing it has remained the oldest known individual of its kind.

Now, with the capture, in May, 1942, of adult banded bank swallow No. 35–59216, the record for the longest known life-span in the species rests with that individual. A brief history of this swallow, so far as it is known, is herewith offered as a further contribution to ornithological knowledge.

Adult bank swallow No. 35–59216 was banded as an incubating individual from a burrow in the south bank of Fish Creek near Oneida Lake, N. Y., on May 27, 1936. Its mate was not banded.

On May 21, 1937, this swallow was recovered (Return 1) as a laying or incubating individual in a burrow only a few yards from the one it occupied the preceding season. Its mate also was a return, banded on May 24, 1935. Incidentally, this is the only occasion on which we have recovered two banded return bank swallows at the same time from the same burrow. This burrow was 23 inches deep, 20 inches below the turf and contained an unlined grass nest.

[1] Dayton and Lillian C. Stoner, *Bird-Banding,* 8: 175–176, 1937.

At the time of recovery No. 35–59216 registered a body temperature of 109.6° Fahr. and weighed 14.4 grams. The body temperature of its mate was 108.0 degrees and it weighed 17.7 grams. In this species there are no external differences between the sexes, but the discrepancy in weight between these two individuals strongly suggests that No. 35–59216 is a male. Since this swallow was at least one year old at the time it was banded in 1936, it was now at least two years old.

On May 24, 1940, No. 35–59216 was again captured (Return 2) from a burrow in the same colony as before and at most only a few yards from the ones it had occupied in 1936 and 1937. The burrow was 30 inches deep and 14 inches below the turf. An *unbanded* individual shared the burrow, indicating that the return swallow had different mates, at least in 1937 and 1940. The body temperature of No. 35–59216 registered 107.8 degrees and it weighed 14.2 grams. This bird was now at least five years old.

On May 25, 1942, No. 35–59216 was once more recovered (Return 3) as an incubating individual in the colony in which it had been captured in 1936, 1937 and 1940. And the burrow which it occupied was not more than a few feet from the site of those occupied by it in those seasons. This burrow was 28 inches deep and 24 inches below the turf. On this occasion the body temperature of the swallow registered 109.8 degrees and its weight was 14.3 grams. This bank swallow had now attained the age of at least seven years.

Certain essential facts regarding bank swallow No. 35–59216 may be thus briefly summarized: It was banded as an incubating adult when at least one year old; at the time of its latest recovery in May, 1942, this swallow was at least seven years old. Between its first capture in 1936 and its latest recovery it had been recaptured as a return in 1937 and 1940. All recoveries were in the same sector of the colony as that in which it was first captured. This swallow had made at least six round-trip journeys between its nesting ground and its winter quarters and had a different mate in at least three of the four seasons that it was captured.

It is of interest to observe that among the 282 banded bank swallows which we have recovered as returns within the inclusive seasons 1924–1942, 18 have been approximately one year old, 170 at least two years old, 58 at least three years old, 23 at least four years old, 11 at least five years old, 1 at least six years and 1, the individual above reported, at least seven years old. The results of our banding investigations to date indicate that the probable average life span of this species is from 2 to 3 years. Moreover, the tendency for a given individual to return season after

season to the exact spot in the colony where it has once nested is exhibited to a remarkable degree.

NEW YORK STATE MUSEUM, ALBANY, N. Y. DAYTON STONER

ALBANY, N. Y. LILLIAN C. STONER

A STING-RAY ATTACK ON A MAN ON THE UPPER AMAZON

I SPENT the years 1921–1931 in geological exploration of the upper Amazon Basin, with headquarters at Iquitos in Peru, during which period I witnessed an attack of a sting-ray on a man and cared for the patient. Dr. E. W. Gudger, who is preparing a paper to answer the question, "Is the sting-ray's sting poisonous?", became much interested when I told him of my observation. He states that authentic personal records of such occurrences are rare and that he has found none for the Amazon, where such attacks may be expected commonly to occur. Urged by him, I have prepared this brief account of what I witnessed.

In January, 1925, in working up stream through shallow stretches of a tributary of the middle Rio Morona in northwestern Peru, Fabriciano Vela, my faithful orderly, while wading barefooted beside my canoe in water about twelve inches deep, on a sandy bottom, was struck in the sole of his right foot by a sting-ray. Upon a bottom of this sort, rays are often extremely common in quiet shallow streams of the Upper Amazon Basin of eastern Peru, and not infrequently wading men are struck after these creatures have become alarmed and confused as many plunging, splashing feet churn and roil the water about them. Fabriciano, appearing to be in great pain almost immediately, cried out in terror and despair as he staggered to a nearby sandy beach to fling himself upon the sand and, holding the wounded foot with both hands, to writhe about in agony, tears trickling down his cheeks despite his resolution not to make a spectacle of himself. I had been told repeatedly that this was the most excruciatingly painful experience which could befall a man in the Amazon jungle and my unfortunate assistant made that contention very convincing indeed.

I had already learned that the Brazilian proprietary medicine known as "Balsamo Divino" was considered the most effective in the treatment of such a case and proceeded with it in the approved manner as soon as possible. This colorless, slightly oily liquid compound of apparently several aromatic ingredients, rather well masked by carbolic acid, suggests the "phenol sodique" of my boyhood days. With a cotton swab saturated with this remedy undiluted, I carefully cleaned and bathed this rather deep stab-wound, and then bandaged the foot lightly so as to hold another similarly saturated swab in place upon the wound while several drops in water were given orally. He had been struck, as I have just said, rather deeply at something of an angle as his foot was raised in stepping forward but the bleeding seemed to me less than one might reasonably have expected. Though he continued for a time in extreme, almost unendurable pain, there was no considerable swelling, nor did he experience nausea, headache nor indeed any systemic symptoms. After several hours, during which the bandage over the wound was kept moist with the medicine, he became quiet and in a short time the wound had healed without sloughing, and indeed without inflammation of any importance, thanks probably to the antiseptic properties of the phenol.

Another boy, Edmundo Araujo, who was with me for a time, was, while on the Rio Ucayali, very grievously wounded by a large ray which drove its terribly venomous spine into the sole of his foot in such a manner that it passed between the metatarsal bones and emerged upon the upper surface. I was not a witness, but he told me later that he had had no idea that one might suffer so fearfully.

HARVEY BASSLER
AMERICAN MUSEUM OF NATURAL HISTORY

QUOTATIONS

SCIENCE AND THE CENSOR

SCIENTISTS in general and physicians in particular will be disturbed by the correspondence which has passed between the postal censor and Dr. J. McKeen Cattell, editor of SCIENCE, and which appears in the current issue of that journal. That censorship in war is necessary no one will deny. But was the censor justified in deleting from SCIENCE an item on a new sulfa drug which can be used with good effect in such intestinal infections as dysentery, because our enemies in tropical regions might learn how to return the afflicted rapidly to the fighting line? From time immemorial military surgeons have made no distinction between friend and foe in dealing with wounds and disease. In 1917 both the Surgeon General of the Army and the Secretary of War decided that for humanitarian reasons publication of information about an antitoxin developed in this country to combat the bacillus of gas-gangrene, then highly destructive on the Western Front, was permissible. Thousands are now dying of typhus in occupied Middle Europe, but if the censor has his way they can not be saved by the dissemination of any new knowledge acquired here.

We detect no such narrowness of view in the few German medical and scientific publications that have reached this office since the attack on Pearl Harbor, nor in the pages of *Nature,* which is apparently permitted to exercise its discretion, and which prints communications of the very type that have been expunged from SCIENCE. The censor was certainly on slippery ground when he deleted references to indium because that metal can provide a satisfactory lining for shaving-cream and toothpaste tubes. The Germans know as much about indium as we. So with the suppression of an item on a method of spraying walls of mines to prevent mercury poisoning. Some of the material to which the censor objected in the case of SCIENCE had been published in newspapers from Maine to California, so that nothing whatever was gained by deletion. To make matters worse, there is no appeal from his decision.

Probably Dr. Cattell is right in holding that the editors of scientific periodicals are better judges of what may or may not be of value to the enemy than technically incompetent postal authorities. If the policy to which he objects is carried out consistently, new scientific books and periodicals must be suppressed. Astrophysicists, biologists, plant and animal breeders, organic chemists who are trying to isolate vitamins and hormones, designers of new electron microscopes, inventors of materials that will resist fire, mathematicians who devise techniques that can be applied in solving the problems of designing engineers—all make discoveries that have some application in totalitarian war.—*The New York Times.*

SCIENTIFIC BOOKS

AN ENTOMOLOGICAL JOURNEY IN ARABIA

In the High Yemen. By HUGH SCOTT. 260 pp. Illustrated. London: John Murray, 1942.

HUGH SCOTT, formerly of the University Museum at Cambridge, now on the staff of the British Museum (Natural History), has long been known as an explorer and a keen student of problems concerning the evolution and distribution of insects. He made great collections of the insect fauna of the Seychelles Islands, in the Indian Ocean, and in the course of years got nearly everything worked up, with the assistance of numerous specialists. More recently, he explored Abyssinia and brought home very extensive collections. The work in Abyssinia naturally brought up questions concerning the life on the opposite or Asiatic side of the Red Sea. The botanist, Schweinfurth, had (1891) published a comparison of the plants of southwest Arabia with those of northern Abyssinia, and noted that while the two floras had much in common, there were some striking differences. The insects, with so many diverse genera and species, might be expected to throw much light on the various problems, but they were little known, so far as Arabia was concerned. It therefore seemed an excellent project to explore the mountainous region of southwest Arabia, and make collections as adequate as the available time permitted. This plan was approved by the British Museum (Natural History), and Dr. Scott, with his companion, E. B. Britton, set out in 1937, going first to Aden. They soon found out that it would be very difficult to do the work proposed, owing to restrictions imposed by the native rulers of Al Yemen and Asir. The latter country could not be entered at all, and although entry into the Yemen had been promised, the permission was withdrawn. It was only after prolonged negotiations that Yemen was opened to the expedition, and then it was only with limitations. Thus permission to climb the highest mountain was denied. In spite of all difficulties, the expedition was very successful and the technical results will occupy Scott and his associates for many years. The scientific reports will all be published by the British Museum, and the first part has already appeared.

The book is very well printed, with very numerous excellent illustrations from photographs, although there is a note to the effect that "The paper and binding of this book conform to the authorized economy standard." It may surprise some to see such a book appearing in the midst of the war, but it is the policy of the British to keep scientific and cultural interests alive, and moreover, as the only really modern account of social, political and economic conditions in the little-known region explored, the narrative may have considerable value in relation to the war. The general conclusion seems to be that while the rule of these Asiatic provinces is arbitrary and in many respects medieval, there is progress in certain directions. Thus, although in general it is so difficult to enter the Yemen, there is an excellent medical missionary, Dr. Petrie, stationed at the capital, and his aid is sought to the limits of his capacity, patients coming in from all over the country. Although Scott and Britton were disappointed in the attitude of the ruler, who found it a little difficult to believe that their interests were purely entomological, they could not deny that in the present state of the world there was every reason to regard the European powers with suspicion. However, in the Aden Protectorate to the south, controlled by the British, there is what might be called home-rule and it does not appear that the British influence is other than beneficial.

It is not possible to modernize these backward countries in a short time, and the process, though justified on economic and commercial grounds, may be far from beneficial. One feels that the "infiltration" of Europeans that is really needed is not that of the commercial or military types, but that of scientific men and Christian missionaries, who are committed to the international point of view and have no reason for seeking profit at the expense of the people. In particular, the medical missionaries, as I have observed them in many parts of the world, represent genuine progress and enlightenment, whatever we may think of their theological dogmas. Scott, commenting on the work of Petrie and his associates, says: "I would emphasize the immense value of their work from every point of view, for the direct alleviation of suffering, for the betterment of understanding between the nations represented on either side, and on the highest spiritual grounds."

Scott records that he left the country with real regret, having received much kindness at the hands of the people, coming to regard many of them with affection. Also, although his collections were very extensive, the insects numbering about 27,000 specimens, it was obvious that there was very much more to be done, awaiting new collectors and new opportunities.

T. D. A. COCKERELL
UNIVERSITY OF COLORADO

REPORTS

THE ROYAL OBSERVATORY, GREENWICH[1]

THIS year's report of the Astronomer Royal refers to the work of the Royal Observatory during the period May 1, 1941–April 30, 1942. London suffered few air attacks during this time, and no further damage to the observatory has occurred. Daylight observing is still carried on at Greenwich, but the larger instruments will, of course, remain dismantled for the duration of the war.

The public time service continues to function from two out-stations, each maintaining, in case of breakdown at the other, a complete time service involving transit observations, clock maintenance and transmission of time signals to the Post Office of the B.B.C. The Rugby vernier signals, which are the precision British time signals, have up to the present normally been transmitted from Station B, since the clocks at station A are mounted in temporary fashion and suffer from serious mutual interference. During the year, however, the three free-pendulum clocks and a quartz clock at station A have been remounted in a specially constructed building, and it is hoped that their behavior will now be sufficiently improved to allow this station to share regularly in the transmission of the rhythmic signals. The published corrections to the Rugby signals and to foreign signals are now based on some or all of nine clocks—seven Shortt clocks and two quartz oscillators—mounted in various parts of the country. By working on a "mean clock" and by making certain changes in the routine of signal transmission, a distinct advance has been made in the precision of the Rugby signals, the value of which as a day-to-day frequency standard has thereby been increased. Accurate allowance for land-line lag is now made before each signal is transmitted. Comparison of the signals against the clocks, or of one clock against another, is now facilitated by the use of thermionic panel units which eliminate the variation of lag inevitable with mechanical relays. Intercomparison of the clocks has shown that in the matter of small erratic changes of rate even the best free-pendulum clocks are inferior to quartz clocks.

The Chronometer Depot has settled down into its new quarters, and repair, rating and issue of chronometers and watches to the Royal Navy have continued without interruption. A vibration machine constructed in the observatory workshop has been brought into use for testing aircraft watches under service conditions. Tests of the effect of magnetic fields of strengths up to 8.5 gauss on the rates of chronometers and watches have been instituted, no doubt with war conditions in mind, and are now nearing completion.

The last report of the observatory stated that work with the Airy transit circle had been terminated after ninety years continuous observation. Since then, news has been received of the destruction of Poulkovo Observatory during the bombardment of Leningrad. This will be such a serious loss to fundamental positional astronomy that observations are to be resumed with the old Greenwich instrument on a restricted program, including particularly transits of the sun. Minor damage to the housing of the instrument has therefore been made good, the instrument has been overhauled, and work will be resumed shortly. Analysis of previous observations with this instrument arranged according to wind direction shows that declinations south of the zenith are measured larger by about 0.10″ when the wind is northeast than when it is southwest. The observations of latitude variation had already given a similar result. This agreement shows the advisability in positional astronomy of applying locally determined latitude variations so as to eliminate spurious annual terms due to systematic sea-

[1] From *Nature*.

sonal fluctuations in wind direction. The division errors of the fixed circle of the new reversible transit instrument show on analysis a cyclic error, recurrent every $2\frac{1}{2}°$, which may reach 0.19″; thus emphasizing the need of determining the division error of each graduation.

The photoheliograph observations show that the expected decline in solar activity continues, though there have been four notable periods of resuscitated activity. Of the four big spot groups the area of which exceeded 1,000 millionths of the hemisphere, two exhibited bright eruptions in Hα light which were later followed by great magnetic storms on the earth. Assuming that the magnetic storms were caused by solar corpuscles emitted at the time of maximum intensity of the chromospheric eruptions, the mean time of travel of the particles is calculated as 20 hours.

The Nautical Almanac Office continues its essential work. Last year's report referred to the destruction by fire of the type and plates for most of its publications: during the early part of the year under review printing delays due to this circumstance and to a change of printing contract caused a dangerous accumulation of arrears. The Nautical Almanac for 1942 was in fact not published until November 3, less than two months before the date to which it refers, but the arrears are being wiped off so satisfactorily that the 1943 edition appeared on April 3. The failure of communications with many of the other ephemeris offices has led to a small increase of computational work; but duplication is avoided so far as possible by interchanging information with such of the offices as are still free to collaborate. The war has hastened a decision which would have been reached in any event, namely, to abandon the indiscriminate provision of occultation reduction elements. The observations for 1938 and 1939 show that the majority of the computed reduction elements are never in fact used, owing to the particular occultation not being observed; and of the remainder most are used once only. In the future the office will do the individual reductions for all observations actually made, provided that observers will do that portion of the reduction depending solely on their position and that of the star. A revision of the Air Almanac has recently been planned in conjunction with the Air Ministry: the effect will be to redistribute the data on the two pages allotted to each day, one of which now becomes a "night" page and the other a "day" page. The change should result in greater simplicity in use, at the expense of a slightly larger page. The present R.A.F. Star Charts are based on a recent investigation carried out by the office on the optimum method of identification of the stars used in aerial navigation.

The Magnetic Department of the observatory, in addition to the regular daily observations of the magnetic elements, is at present engaged in preparing charts for the Admiralty showing the iso-magnetic lines in declination, horizontal intensity, inclination and vertical intensity. The declination charts, of which the previous edition was published in 1937, are now ready; those for *H* and dip, for which the previous editions are dated 1922, are well advanced. Vertical-intensity charts are a novelty.

Features of the year's weather observed at Greenwich include a very wet August (4.146 in.) followed by an unprecedented lack of rain in September and October, during which only 1.41 in. fell. The winter was conspicuous for cloudiness, the sunshine recorded being only 55 per cent. of the average, and for consistently low temperatures in January and especially in February, which had a record number of days (twenty-six) on which temperatures below freezing were recorded.

Visitors to Greenwich Park will miss the famous 24-hour clock dial at the shattered main gates of the observatory, and the daily fall of the time ball; but the familiar domes are still there, though somewhat perforated, and the Wren building still stands guard over the all too characteristic bend in the river. Meanwhile, as the familiar, never-failing "six-pips" testify, the work of the Royal Observatory goes on.

SPECIAL ARTICLES

THE EFFECT OF HUMIDITY ON BETA STREPTOCOCCI (GROUP C) ATOMIZED INTO AIR

MICROORGANISMS in atomized droplets pass through a critical period in changing from an aqueous to an atmospheric state of suspension. The duration of this transient stage naturally depends upon air humidity. Sampling methods, adequate for studying subsequent mortality of residual organisms in static experimental atmospheres, may yet be too coarse for distinguishing such effects.

In the development of a dynamic method for study of disinfection of atomized air-suspended microorganisms, some eighty experiments in design of apparatus, development of techniques and exploration of bacterial behavior have been performed. An experiment consisted of two or more runs in altered atmospheres, each run involving six simultaneous volume and settling samples from two consecutive atmospheric exposures.

Confusion reigned until lethal effects of humidity changes in exposure chambers were evaluated. Their magnitude had not been suspected. High humidity

neutralized and low humidity masked the disinfecting action of propylene glycol vapor. Disinfection was most apparent at intermediate humidities.

Seven series of experiments representing comparable relative humidities, concentration of disinfectant and time of exposure have been tabulated (Table I). Normal room humidity existing during the late

TABLE I
LETHAL EXPOSURE

Series	Experiments	First Exposure: Time seconds	First Exposure: Glycol conc mg/l	First Exposure: Humidity	First Exposure: Lethes	Second Exposure: Time seconds	Second Exposure: Glycol conc mg/l	Second Exposure: Humidity	Second Exposure: Lethes
VII	3	60	.00	±	.10	60	.00	±	1.75
VII	"	"	.00	−	1.75	"	.00	−	1.26
I	5	10	.00	±	1.50	10	.00	±	.04
I	"	"	.05	±	4.27	"	.05	±	.07
II–IV	11	60	.00	+	.50	6	.00	±	1.07
II–IV	"	"	.30	+	1.50	"	.05	±	3.74
V–VI	5	60	.00	+	.55	6	.00	+	.14
V–VI	"	"	.30	+	1.20	"	.05	+	.18

winter and early spring is represented by ±; added humidity by +; and deficiency due to dehumidification by − sign. The results are reported in terms of lethes —a lethe being equivalent to bacterial removal by one displacement of the atmosphere within the chamber. Air change is a ventilating term which simplifies expression of air disinfection.

Results on beta streptococci (Group C), averaging 3.6 lethes with and 1.27 lethes without glycol vapor, corroborate British results on aerosols of hexylresorcinal dissolved in propylene glycol[1] and American results on propylene glycol aerosols without hexylresorcinal[2] and later results on propylene glycol vapor.[3] Expressed in terms of lethes, these laboratory findings can readily be converted into sanitary ventilation equivalents.

Uniform dilutions of glycol vapor and humidity (Series I) were more lethal on first than on second exposure. Where first exposed to higher concentration of propylene glycol vapor and moisture (Series II–IV) lethes were higher on the second exposure. In humid air (Series V–VI) neither exposure showed marked lethal effect, but combined glycol vapor and humidity (second runs) seem to neutralize each other. Dehumidification with calcium chloride, on the other hand (Series VII), gave lethal results comparable to propylene glycol. Exposure in the apparatus following glycol experiments showed lethal lag, resulting perhaps from condensation or absorption on interior surfaces.

The possibility that results reported by English workers might be due less to toxic effect of hexylresorcinal aerosols, and those reported by American workers due less to the toxicity of glycol vapor than to desiccation produced by this hygroscopic substance, can not be overlooked. Disagreement among various workers[4] on the mode of disinfection, together with low toxicity of propylene glycol in aqueous solution, raises questions which await better understanding of relationship to humidity.[5] Retabulated on the assumption that the results are due to dehydration (Table II), they fall into alignment.

The decrease in effectiveness of a fumigant with increased humidity runs counter to accepted theory of fumigation; neither does disinfection rate (disregarded in Table II) conform to the normal law of equal

TABLE II
LETHAL DEHYDRATION

Series	Experiments	Lethes with differing humidity: Humidified	Average humidity	Dehumidified
VII	3	..	1.85	** 3.00
I	5	..	1.54	* 4.34
II–IV	11	..	1.58	* 5.24
V–VI	5	.69	* 1.39	...
Average	24	.69	1.59	4.29

* Assuming desiccation by propylene glycol.
** By calcium chloride.

proportionate bacterial decrease in equal time intervals. Mortality seems to occur at critical phases rather than to follow the normal logarithmic type of death rate.

These results are preliminary to a more detailed description of the method and to a more thorough study of air disinfection.

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[1] C. C. Twort, A. H. Baker, S. R. Finn and E. O. Powell, *Jour. Hygiene*, 40: 253, 1940.

[2] O. H. Robertson, E. Bigg, B. F. Miller and Z. Baker, SCIENCE, 93: 213, 1941.

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[4] A. Trillat, *Rev. de path. comp.*, No. 510 (March): 292, 1939; R. J. V. Pulvertaft, G. C. Lemon and J. W. Walker, *Lancet*, 443, 1939; A. T. Masterman, *Jour. Hygiene*, 41: 44, 1941; A. E. Williamson and H. B. Gotaas, *Industrial Medicine*, 11: 40, 1942; O. H. Robertson, E. Bigg, B. F. Miller, Z. Baker and T. T. Puck, *Transactions of Assoc. of Amer. Physicians*, Vol. LVI, 1941.

[5] A. H. Baker and C. C. Twort, *Jour. Hygiene*, 41: 117, 1941.

[6] These laboratories are supported by a grant from the Commonwealth Fund to the University of Pennsylvania for studies in the prevention and control of air-borne infection. These experiments were conducted at the Henry Phipps Institute.

ISOLATION OF A NEW "CAROTENOID" FROM RAT LIVER

DURING an investigation of the influence of carcinogenic hydrocarbons upon the hepatic vitamin A stores of mice and rats,[1] there was observed not only a marked difference in response by the two groups of animals, but even an unlikeness in the chemical composition of the unsaponifiable fraction of the livers. A study of this latter interesting dissimilarity has led to the isolation of a new carotenoid-like substance.

The mice and rats were killed by a sharp blow on the head and the livers removed at once. These organs were then macerated, saponified and extracted with peroxide-free ethyl ether, according to the technique of Davies.[2] Chloroform solutions of the unsaponifiable fraction of mouse livers were invariably colorless, while those derived from rats were always a light yellow.

The unsaponifiable fraction of the livers dissolved in chloroform was treated with a saturated solution of antimony trichloride in the same solvent (Carr-Price reaction), and the colored mixture resulting was examined immediately, and at short intervals thereafter, for the appearance and disappearance of spectroscopic absorption bands. Mouse livers usually exhibited only one readily visible absorption band for vitamin A, that at 620 mμ. However, by concentrating the chloroform solution so that 1 cc contained the unsaponifiable fraction of 3 to 6 livers, a faint band at 570 mμ could be seen also.

On the other hand, the unsaponifiable fraction of rat livers showed a stronger band at 565–570 mμ besides the 620 mμ band for vitamin A. The persistence of these bands was somewhat dependent upon the concentration of the unsaponifiable fraction and also upon the amount of added antimony trichloride. Nevertheless, both bands (620 mμ and 565–570 mμ) made their appearance immediately with the addition of the reagent, although the 565–570 mμ band proved more enduring. Although the mice were fed Rockland Mouse Pellets, and the rats received Purina Dog Chow, a reversal of diets failed to alter the above reactions.

The "carotenoid" was isolated as follows: The residue of the unsaponifiable fraction of the livers from 4 to 6 mature rats was taken up in 50 to 70 cc of petroleum ether (30°–60°). This extract was then added to a 500 cc Erlenmeyer flask, containing approximately 50 gm of finely powdered Kaolin (China clay), which had previously been well wetted with petroleum ether. Adsorption of the yellow substance apparently occurred instantaneously, for the Kaolin at once assumed a purple color. However, the mixture was shaken and allowed to stand for a few minutes.

The supernatant petroleum ether solution, now colorless, was decanted and the Kaolin washed three to four times with 50 to 70 cc portions of petroleum ether to remove any unadsorbed unsaponifiable substances. After separation of the greater part of the petroleum ether, the adsorbed "carotenoid" was eluted with absolute methyl alcohol. The colored substance dissolved easily in the remaining petroleum ether-methyl alcohol mixture. Final separation from the Kaolin was accomplished by filtration through Munktell's OA. paper.

When the solvents were removed from the eluate on a steam bath and the Carr-Price reaction applied to the eluate in chloroform at 0°, an absorption band at 585–587 mμ was seen. This band was too transient to be observed at room temperature. It is not known whether isomeric changes occurring during adsorption and elution can explain the shift in absorption from 565–570 to 585–587 mμ.

The "carotenoid" was crystallized as follows: After evaporating the methyl alcohol-petroleum ether mixture from the eluate on the steam bath, the orange-yellow residue was dissolved in 95 per cent. alcohol with heating. The cholesterol was removed by adding a hot alcoholic solution of digitonin and allowing the mixture to cool to room temperature. The cholesterol digitonide was filtered off, and the filtrate evaporated to dryness in a vacuum desiccator. The residue was then dissolved in ethyl ether, any excess digitonin being left behind.

After removing the ether on a steam bath, the residue was dissolved in a few cc of carbon disulfide, and the solution poured into 10–20 cc of hot absolute methyl alcohol. The "carotenoid" crystallized at −12°, and the crystals were separated by filtration at 0°, in a cold room. Approximately 10–12 mg of the new "carotenoid" was obtained from five rat livers. A solution of the "carotenoid" in chloroform did not show any maxima from 350 mμ to 850 mμ when examined spectrophotometrically, which rules out the carotenes. The "carotenoid" is solid at 0° and at this temperature showed an absorption band at 585–587 mμ when treated with a cold solution of antimony trichloride.

Carbon and hydrogen were determined by micro combustion.[3]

Analysis

3.885 mg substance:	4.325 mg H_2O and	11.475 mg CO_2
3.185 " " :	3.580 " " "	9.310 " "
Calculated for $C_{16}H_{30}O$.		C 80.59, H 12.69
Found.		" 80.52, " 12.45
		" 80.40, " 12.70

The "carotenoid" is quite soluble in chloroform, ethyl ether, carbon disulfide and petroleum ether. It

[1] C. Carruthers, *Cancer Research*, 2: 168, 1942.
[2] A. W. Davies, *Biochem. Jour.*, 27: 1770, 1933.
[3] Micro combustions done by Dr. Carl Tiedcke, New York, N. Y.

is less soluble (25°) in absolute methyl alcohol and in ethyl alcohol.

The absorption band at approximately 570 mμ has been observed by others, but its significance was never before determined. Van Eekelen, Emmerie, Julius and Wolff,[4] and Willstaedt and Jenson,[5] have postulated that the 570 mμ "chromogen" is another vitamin A. Karrer and Morf[6] suggested that hepaxanthin may give this same chromogen. On the other hand, Brockmann and Tecklenburg[7] found that oxidation products of vitamin A (*in vitro*) yield an absorption band at 570 mμ.

Further work is in progress to determine the structure of the new "carotenoid." Whether it is an intermediate metabolite of vitamin A or of β carotene, remains to be determined.

SUMMARY

A new carotenoid-like substance has been isolated from rat liver. A method for its separation and some of its properties are given.

The authors wish to express their gratitude to Dr. H. F. Seibert, of the S.M.A. Corporation, for the samples of the β carotene used in these studies.

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MOCK-DOMINANCE AND HYBRID VIGOR

Two plant varieties, one of which has twice as many internodes of half the length as the other, will be equal in height. A hybrid between these varieties will exceed their height by 12½ per cent. if internode number and length are exactly intermediate in inheritance, *i.e.*, if dominance is lacking. Here, then, is an apparent dominance for plant height, or an example of hybrid vigor in its pristine sense, that is not the result of dominance in its genetic meaning. This effect may conveniently be called *mock-dominance*. It results from the fact that plant height is determined as the product of number and length of internodes and from the relations that obtain between the means of products and the product of means.

These relations are simply shown by considering the products A′B′ and A″B″. Their mean, of course, is:

$$\frac{A'B' + A''B''}{2} \qquad (1)$$

The product of the means of the two components, on the other hand, is:

$$\frac{A'B' + A''B'' + A'B'' + A''B'}{4} \qquad (2)$$

Now:

(1) = (2) when A′=A″, or B′=B″, or both (3)
(2) < (1) when A′>A″ *and* B′>B″, or *vice versa* (4)
(2) > (1) when A′>A″ *but* B′<B″, or *vice versa* (5)

The relations indicated by (3), (4) and (5) apply generally to all characters that are the products of component dimensions which, in turn, are intermediate and independent in inheritance. It is evident that (3) describes what frequently may be expected in crosses between similar varieties, and (4) what may be expected when varieties similar in proportions but differing in size are crossed. The mock-dominant effect described by (5) is the expectation for characters in crosses between varieties differing in type with respect to those characters. The importance of this effect will depend upon its magnitude and its generality of occurrence. Adequate data on these points are not available.

Examples of characters in which this effect may frequently be manifest come at once to mind. The yield of grain per plant in cereals is the product of the number of grains and their average weight. Many-seeded varieties often tend to have relatively small grains and *vice versa*. Plant height has been referred to. Individual leaf area is the product of length and width. Longer corn leaves often are narrower than shorter leaves, particularly for extremes in length and width. Crosses between contrasting types should have leaves with larger areas than the mean of the parents. If the parent having leaves with smaller areas has more leaves than the other parent, there would be a cumulative mock-dominant effect on total leaf area per plant. The weight of ear in corn is the product of length, diameter and density. Length of ear, in turn, is dependent on number and length of the cob internodes, and density is even more complex.

The characters mentioned are among those the measurements of which have been largely used in the quantitative determination of hybrid vigor. They also are characters generally conceded to be controlled in inheritance by numerous genes lacking dominance. The same principles will apply to rates which are the products of subsidiary rates. Thus, growth rate is the product of the rates of cell division and of cell enlargement. Again, intense chlorophyll and small leaf area from one parent combined with weak chlorophyll and large leaf area from the other would establish a basis for superior photosynthesis in the hybrid.

[4] M. Van Eekelen, A. Emmerie, H. W. Julius and K. L. Wolff, *Acta Brevia Nederlandica*, 1: 8, 1931.
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There is an ever-increasing body of evidence pointing to the interaction of dominant favorable genes as a sufficient explanation for hybrid vigor, and there is no intention here to explain this phenomenon on the basis of mock-dominance. The conditions necessary for its occurrence would not exist universally enough. Again, estimates based on available measurements indicate that the effects would be too small to account for any substantial part of such increases as are obtained, for example, in crosses between inbred lines of corn. Finally, it is doubtful whether even linkage and interference could excuse the failure to recover strains equal to the hybrid more frequently than has been the case in the past.

On the other hand, mock-dominance seems entirely adequate to account for the small excesses, of the order of 2 to 5 per cent., above the parental means that are reported from time to time in connection with breeding results. Whether it is a correct explanation in any case could be determined rather easily and definitely. When it is, such case will be eliminated from need of further consideration in connection with hybrid vigor in its broader sense, thus simplifying that problem. Moreover, it will be just those hybrids that are vigorous because of mock-dominance that will offer the greatest possibilities for isolating vigorous, true-breeding strains.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE PHOTOELECTRIC RELAY

THE combination of a mirror galvanometer and a photoelectric relay is ideal for the control of many systems where the null condition is to be maintained. The relay circuit described by Soller, Goldwasser and Beebe[1] was tried in the Kansas Agricultural Experiment Station milling research laboratory for the control of an adiabatic calorimeter for the measurement of the heating of damp wheat. Their circuit relies upon insulation leakage for the grid leak of the amplifier tube. Wide variations in the humidity of the air plus large voltage fluctuations in the electric current available caused frequent failure of the relay. This difficulty was overcome by rectifying the control circuit so that a grid leak of from 2 to 10 megohms could be used. The diode of a type 75 tube served for the rectification, while the triode replaced the 6C6 amplifier of the original circuit, so that the use of an additional tube was avoided.

With the introduction of the 117L7GT tube in 1940, considerable simplification was possible, since this tube has sufficient voltage amplification that the preliminary amplifier tube is not ordinarily necessary, and it also contains a rectifier section, which can be used to supply D.C. grid bias. Fig. 1 shows the circuit and specifies parts which will be satisfactory for most applications. Sensitivity may be increased by using higher values for R_3: 20 megohms should not cause instability. Adjustable sensitivity may be obtained by substituting a 1 megohm volume control for R_2. If a vacuum phototube is used instead of the gas-filled type 918, R_1 may be omitted and R_3 may be increased even to several hundred megohms if necessary for the required sensitivity.

[1] T. Soller, S. Goldwasser and R. A. Beebe, *Jour. Am. Chem. Soc.*, 58: 1703–1706, 1936.

Contribution No. 86, Department of Milling Industry, Kansas Agricultural Experiment Station.

The 117L7GT tube is rated at 45 milliamperes, but when operating on A.C. as in this circuit, the output can not be expected to be more than 30 to 35 milliamperes. For this reason the relay S_1 should operate on 30 milliamperes or less at not over 90 volts. The G. M. Laboratories type DD60B(64–14)CW relay has given good results, as has the Struthers Dunn midget relay wound for 50 volts or for 90 volts D.C. Ordinarily the screen resistor, R_4, can be omitted altogether, but some tubes have been found which overheat and fail to control if this is done, so 1,000 ohms is recommended as a minimum. If a relay operating on less than 15 milliamperes is used, R_4 should be increased to reduce the plate current of the tube to about the value required by the relay: 10,000 ohms will usually be satisfactory for relays using from 10 to 15 milliamperes.

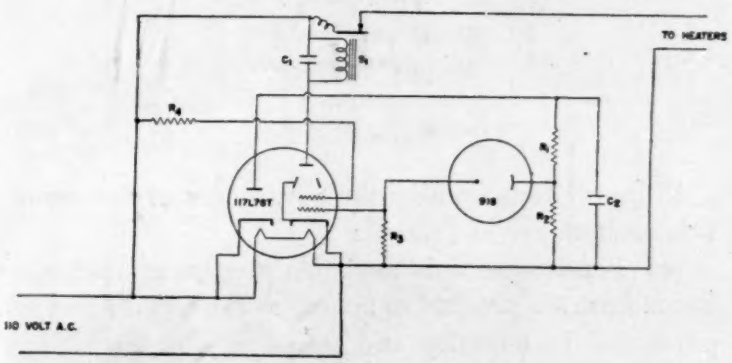

FIG. 1. C_1, electrolytic condenser, 4 or 8 mfd.; C_2, paper condenser, 0.1 mfd.; R_1, carbon resistor, 300,000 ohm; R_2, carbon resistor, 1 megohm; R_3, carbon resistor, 2 megohm; R_4, carbon resistor, 1000 ohm; S_1 relay. RCA type 918 gas-filled phototube. Type 117L7GT radio tube.

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A NEW AGAR MEDIUM FOR DROSOPHILA CULTURE[1]

TEACHERS and investigators who have been rearing *Drosophila melanogaster* on banana-agar medium and who are now concerned about the predicted banana shortage will be interested in the writer's experience in developing a war-time formula in which he has substituted canned tomato paste for banana. Oddly enough this substitution, mothered by necessity, produces a medium seemingly superior to either the banana or the cornmeal medium so long in use. It was Professor C. E. Myers who suggested that a tomato product might offer possibilities as a banana substitute. This suggestion came as a result of his observation that during the fermentation of tomato pulp for seed-saving great numbers of fruit-flies are attracted to the pulp barrels.

A two-month experimental period in the preparation and use of tomato-paste medium has provided time in which to test proportions of ingredients of the formula, to observe the properties of the resultant medium and to note the size and vigor of the yields obtained. The formula recommended is as follows, with the customary drop of Fleischmann's yeast suspension to be added to each culture when the flies are introduced.

1000 cc water
100 gm tomato paste
100 gm white corn syrup
20 gm granulated agar-agar
1 gm Moldex

In the writer's opinion the advantages of the use of this medium are as follows:

(1) Tomato paste is available at grocery stores as a standardized product in six-ounce cans which may be purchased in quantity and stored in the laboratory, thereby eliminating the nuisance and uncertainty of obtaining bananas properly ripened at any or all seasons of the year.

(2) The cost of tomato paste plus corn syrup is not greater than that of bananas and the labor involved in its preparation is of shorter duration and far less "messy."

(3) The red color imparted to the medium by the tomato paste provides a background against which students may readily observe the progress of their crosses, for on the bright red agar the tiny white eggs are discernible and the movement of the first larvae easily detected.

(4) The cultures do not dry out, for there is ample moisture in the medium to support the culture over a period of three to four weeks and to keep the absorbent paper sufficiently moistened for successful pupation.

(5) The use of Moldex makes it possible to store at ordinary room temperature unautoclaved medium for two weeks or longer in plugged culture bottles which were sterilized before filling. With the addition of a drop of yeast suspension these bottles are ready for use at any time during a two-week period.

Optimism in regard to the timeliness of this formula must be tempered by the fact that at any moment its usefulness may be restricted by additional war-time shortages in agar, in syrup or in cans for processing tomato paste. However, it is strongly felt that the use of this formula will outlive the need for it.

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THE PENNSYLVANIA STATE COLLEGE

[1] Authorized for publication on May 28, 1942, as paper No. 1104 in the Journal Series of the Pennsylvania Agricultural Experiment Station.

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